

Diamond gum (*Eucalyptus rhomboidea*: Myrtaceae), a new threatened species endemic to the Bremer Range of the Southwest Australian Floristic Region

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Abstract

Hopper, S.D. & Nicolle, D. Diamond gum (*Eucalyptus rhomboidea*: Myrtaceae), a new threatened species endemic to the Bremer Range of the Southwest Australian Floristic Region. *Nuytsia* 17: 185–194 (2007). *Eucalyptus rhomboidea* Hopper & D.Nicolle, first collected by the late Ken Newbey in 1979, is described as new. The species is a member of *Eucalyptus* ser. *Subulatae* Blakely allied to *E. transcontinentalis* Maiden. It is confined to the Bremer Range, and it is at risk from present and proposed mining activities.

Introduction

The Southwest Australian Floristic Region (SWAFR, *sensu* Hopper & Gioia 2004) is rich in c. 8000 species of native plants, some 50% of which are endemic, with about a third of the flora under threat. Until recently, those endemics confined to scattered ironstone and mineralised hills on the semi-arid margins of the SWAFR were rarely so threatened as to be of significant conservation concern. However, recent economic circumstances have rendered several such hills and banded ironstone inselbergs sufficiently attractive to fast-track mining. Almost overnight, ranges rich in localized mineral prospectivity and exceptionally rich in plant endemics have become seriously threatened because of the scale of mining proposed or underway (e.g. Bandalup Hill and the Ravensthorpe Range near Ravensthorpe). The taxonomy of many of these threatened endemics needs further research, with several undescribed species among them. Here, we describe one such example.

The Bremer Range is a series of mineralised low hills, largely of greenstone with some banded ironstone, extending for 60 km along the south-eastern side of Lake Johnston and Lake Hope, to the north of the Norseman – Lake King road. The Range and its highest peak, Mt Gordon, were named for the naval officer Sir Gordon Bremer by Western Australia's first Surveyor General John Septimus Roe on his 1848–49 expedition from Albany to the Russell Range (How *et al.* 1988). Subsequently, the Bremer Range was traversed by the explorer Frank Hann in September 1901, who almost circumnavigated Lake Johnston and named it for the then Surveyor General H.F. Johnston (Donaldson & Elliot 1998). Because the Range is located off and between the two major east-west roads linking Hyden and Lake King to Norseman, it escaped detailed floristic survey until the past three decades.

Beard (1976) first described the major structural vegetation formations in the Bremer Range

area but did not complete sufficient field work to document the flora in detail nor collect the species described as new herein.

Eucalyptus rhomboidea Hopper & D.Nicolle was encountered by one of us (SDH) in 1989 in the course of a survey commissioned by the Environmental Protection Authority to delineate proposed conservation reserves in the extensive goldfields eucalypt woodlands between the wheatbelt and Nullarbor Plain of southern Western Australia (Henry-Hall *et al.* 1990).

Subsequently, an earlier collection (*K.R. Newbey* 5603) made in 1979 was located in the Western Australian Herbarium determined as "*Eucalyptus* aff. *transcontinentalis*". The late Ken Newbey made the collection when engaged as consultant survey botanist for the Biological Survey of the Eastern Goldfields, an interagency project from 1977–1983 then involving the Western Australian Museum, the Department of Fisheries and Wildlife's Western Australian Wildlife Research Centre, the Western Australian Herbarium and the National Parks Authority (How *et al.* 1988).

In the relevant published report, *Eucalyptus rhomboidea* is mentioned by Newbey and Hnatiuk (1988) in their Table 4 listing important plant collections as "*Eucalyptus* sp. (KRN 5603)". They indicated that this was the first collection of a taxon considered to be undescribed and endemic to the Lake Johnston – Hyden study area. Eucalypt taxonomist Ian Brooker is acknowledged by Newbey and Hnatiuk (1988) for assistance with eucalypt identifications, so it is probable that Brooker was the first to consider Newbey's collection as sufficiently distinct to be a possible new taxon not matching anything then named.

Newbey and Hnatiuk (1988: Table 3 and pp. 134–135) used *Eucalyptus rhomboidea* to characterise a unique low woodland type (<15 m tall) on undulating greenstone plain country. They indicated that this low woodland was "very rare" with the average size of individual areas encountered in their survey being <1 ha. Newbey and Hnatiuk (1988: 33) provided the following brief description of associated species in the *Eucalyptus rhomboidea* Low Woodland:

"Low trees of *Eucalyptus eremophila* occurred in *Eucalyptus* sp. (KRN 5603) Low Woodland. Tall shrubs included *Melaleuca lanceolata*, and low shrubs included *Acacia poliochroa sens. lat.*, *A. rendlei*, *Eremophila caerulea*, *M. cardiophylla* var. *cardiophylla* and *Westringia cephalantha*."

Newbey and Hnatiuk (1988: 134–135) also provided a detailed ecological description of one vegetation site named as a *Eucalyptus* sp. (KRN 5603) Low Woodland (reproduced herein as Table 1).

Based on unpublished field notes of SDH, Henry-Hall *et al.* (1990: 102) provided a brief account of species associated with *E. rhomboidea* in their submission for a proposed Bremer Range Nature Reserve:

"The diverse eucalypt woodlands present on the Bremer Range uplands include the endemic *Eucalyptus "rhomboidea"* (Diamond Gum) ... In the vicinity of Burmeister Hill, *Eucalyptus "rhomboidea"* occurs with *E. salubris*, *E. flocktoniae* [= *E. urna* in this vicinity, Nicolle and Conran 1999], *E. salmonophloia* and *E. cylindrocarpa* over an understorey of *Melaleuca* spp. In the Mt Glasse area, *Eucalyptus "rhomboidea"* was recorded with *E. salubris*, *E. gracilis*, *E. eremophila* and *E. densa* subsp. *densa* over mallees of *E. pileata*, *E. cylindriflora* and *E. aff. leptophylla* [SDH 7212, = *E. olivina*]."

Table 1. Description of a Bremer Range vegetation site in which *Eucalyptus rhomboidea* dominates a low woodland (from Newbey & Hnatiuk 1988: 134).***Eucalyptus* sp. (KRN 5603) [= *E. rhomboidea*] Low Woodland****LOCATION:** SE of Mt Glasse **DATE:** 16 August 1979**VEGETATION**Stratum 1: Trees 10–13 m, 3% canopy cover, *Eucalyptus* sp. (KRN 5603)Stratum 2: Trees 8–10 m, 5% canopy cover, *Eucalyptus eremophila*Stratum 3: Shrubs 2.1–2.7 m, 5% canopy cover, *Melaleuca pauperiflora*Stratum 4: Shrubs 1.6–2.0 m, <1% canopy cover, *Melaleuca eleuterostachya*Stratum 5: Shrubs 1.1–1.5 m, 0.2% canopy cover, *Eremophila pachyphylla*, *Daviesia* sp. (KRN 5598) [= *D. argillacea* Crisp], *Exocarpos aphyllus*Stratum 6: Shrubs 0.6–1.0 m, 3.6% canopy cover, *Melaleuca cardiophylla* var. *parviflora*, *Phebalium filifolium*, *Cryptandra nutans*, *Glischrocaryon aureum* var. *angustifolium*Stratum 7a: Shrubs 0.0–0.5 m, 10% canopy cover, *Eremophila caerulea*, *Westringia cephalantha*, *Acacia poliochroa* s. lat. [= *A. quinquenervia* Maslin], *A. rendlei*, *A. erinacea*, *A. nodiflorus* var. *ferox*, *Cooperookia strophiolata*, *Cryptandra* sp. (KRN 6824) [= *Cryptandra minutifolia* Rye subsp. *brevistyla* Rye], *Daviesia* aff. *colletoides*, *Glycyrrhiza acanthocarpa*, *Grevillea acuaria*, *Olearia muelleri*Stratum 7b: Miscellaneous plants, <1% canopy cover, annuals (*sic*) *Prasophyllum nigricans*; parasitic climbers *Cassytha melantha*.**No. of TAXA:** 26**LAST BURNT:** c. 60 years**LANDFORM****BEDROCK:** greenstone**UNIT:** undulating plain, greenstone**GEOLOGICAL SURFACE:** mafic extrusive rocks, fine to medium-grained**ELEMENT:** low rise**SOIL PROFILE**

A 0–18 cm: dusky red clay loam; very friable; 30–60% subrounded ironstone 5–15 mm across

B 18–68 cm: weak red medium clay; firm; inclusions similar to above; slightly calcareous; pH 9.0, too stony to auger deeper

SOIL**NORTHCOTE:** A horizon with surface crust; A2 horizon not bleached; soil reaction trend alkaline**MAIN ORIGIN:** *in situ* weathering**MAIN ATTRIBUTE:** stony**ROCK:** nil**PAVEMENT:** 30–60% cover of material 4–15 mm long, patchy**LITTER:** Logs few; branches few; leaves broad, deposits 2 cm thick, averaging

6 m apart

GROUP: shallow calcareous earths**DRAINAGE:** good**SURFACE:** hardsetting**STONE:** nil**COMMENTS****DISTRIBUTION:** only patch seen, 0.8 ha.**PROFILE THICKNESS:** 70–100 cm

The proposal for a Bremer Range Nature Reserve by Henry-Hall *et al.* (1990) was formally adopted as a proposal by the Department of Conservation and Land Management in its South Coast Region Regional Management Plan (Anon. 1992). Conservation of endemics such as *E. rhomboidea* was included as part of the justification for the proposed nature reserve. Unfortunately, because of mineral prospectivity, this proposal to create the Bremer Range Nature Reserve has yet to be enacted by Government.

In the spring of 1994, a comprehensive floristic survey of the Bremer Range and hills to the north was undertaken by Gibson and Lyons (1995, 1998) to define plant communities and contribute towards their conservation. *Eucalyptus rhomboidea* was recorded in all seven sites clustered as community type 1, with 40 associates (Table 2). These authors established further support for a low woodland community characterised by *E. rhomboidea* (i.e. their Community Type 1).

In April 1998 the junior-author traversed the main Bremer Range track and made several more collections of *E. rhomboidea* as part of a PhD research program investigating the taxonomy and phylogeny of *Eucalyptus* ser. *Subulatae* Blakely (Nicolle & Conran 1999; Nicolle *et al.* 2006). Collectively, we have had the opportunity to conduct comparative herbarium, glasshouse and field studies of *E. rhomboidea* and other related taxa, as well as examination of types or their photos of all named taxa in *Eucalyptus* ser. *Subulatae*. It is clear that the species is indeed new. This paper, therefore, formally describes *E. rhomboidea*, and briefly discusses its affinities, ecology and conservation status.

Table 2. The 40 associated species found with *Eucalyptus rhomboidea* (in order of co-association) in the seven quadrats clustered as community type 1 by Gibson and Lyons (1988). Note that these data may, in part, include associates of *E. sheathiana* from near Round Top Hill, which was misidentified as *E. rhomboidea* (cf. N. Gibson & M. Lyons 1975, PERTH 05306957).

<i>Melaleuca pauperiflora</i> Turcz. (7 quadrats)	<i>Melaleuca lateriflora</i> Benth. (2)
<i>Eremophila clavata</i> Chinnock (6)	<i>Melaleuca pentagona</i> Labill. (2)
<i>Eucalyptus eremophila</i> (Diels) Maiden (6)	<i>Cassythia melantha</i> R.Br. (2)
<i>Acacia deficiens</i> Maslin (4)	<i>Pultenaea arida</i> E.Pritz. (2)
<i>Grevillea acuaria</i> Benth. (4)	<i>Melaleuca phoidophylla</i> Craven (2)
<i>Westringia cephalantha</i> (4)	<i>Daviesia argillacea</i> Crisp (2)
<i>Melaleuca uncinata</i> R.Br. (3)	<i>Dodonaea stenozyga</i> F.Muell. (2)
<i>Acacia hystrix</i> Maslin (3)	<i>Eucalyptus flocktoniae</i> (Maiden) Maiden (2)
<i>Acacia erinacea</i> Benth. (3)	<i>Microcybe multiflora</i> Turcz. var. <i>multiflora</i> (2)
<i>Daviesia benthamii</i> Meisn. (3)	<i>Eremophila psilocalyx</i> F.Muell. (2)
<i>Wilsonia humilis</i> R.Br. (3)	<i>Westringia rigida</i> R.Br. (2)
<i>Melaleuca eleuterostachya</i> F.Muell. (3)	<i>Olearia muelleri</i> (Sond.) Benth. (2)
<i>Exocarpos aphyllus</i> R.Br. (3)	<i>Dianella revoluta</i> R.Br. (1)
<i>Santalum acuminatum</i> (R.Br.) A.DC. (3)	<i>Triodia scariosa</i> N.T.Burb. (1)
<i>Acacia camptoclada</i> C.R.P.Andrews(2)	<i>Eucalyptus transcontinentalis</i> Maiden (1)
<i>Melaleuca acuminata</i> F.Muell. (2)	

Taxonomy

Eucalyptus rhomboidea* Hopper & D. Nicolle, *sp. nov.

Affinis *Eucalypto transcontinentali* Maiden sed characteribus sequentibus distinguitur: foliis adultis crassioribus et latioribus; alabastris fructibusque non-pendulis; pedunculis et pedicellis brevioribus; alabastris rhombeis; operculis conicis; fructibus obconicis vel pyriformis differt.

Typus: Bremer Range track, Western Australia [precise locality withheld for conservation purposes], 21 April 1998, *D. Nicolle* 2274 (*holo*: PERTH 07618743; *iso*: AD, CANB).

Eucalyptus rhomboidea Hopper ms, in , in G. Paczkowska & A.R. Chapman, West. Austral. Fl.: Descr. Cat. p. 381 (2000), *nom. inval.*

Tree, non-sprouter (mallet), 8–18 m tall. *Bark* smooth throughout, dull, grey to light grey over cream to orange-brown or yellow-brown, decorticating in strips and short ribbons. *Branchlets* pruinose, pith glands absent. *Cotyledons* bisected. *Seedling leaves* opposite for >20 pairs, linear at first, soon becoming sessile and strongly decurrent, ovate to elliptic, undulate, to 40 mm long × 32 mm wide, more or less concolorous, dull, blue-green, glaucous, especially on new growth. *Adult leaves* disjunct, pendulous, petioles 23–30 mm long; lamina lanceolate, 110–155 mm long × 18–35 mm wide, concolorous, dull, blue-green; reticulation moderately dense, oil glands abundant, mostly at intersections of veinlets. *Inflorescences* axillary, unbranched, held erect, 7-flowered; peduncles somewhat angular, 7–12 mm long; pedicels stout, 1.5–3.5 mm long. *Buds* pruinose, rhomboid (diamond-shaped), 9–11.5 mm long; operculum conical, 6–7 mm long, smooth, scar present. *Stamens* irregularly flexed, all fertile; anthers basifixed, ovoid, opening by slits. *Flowers* creamy-yellow. *Ovules* in 4 vertical rows. *Fruits* held erect, usually pruinose, especially when young, shortly pedicellate, obconical although often slightly contracted at rim, 7.5–8.5 mm long × 7.5–9 mm diam., smooth; disc ± level and often prominent, 1–2 mm wide; valves (3)4; style tips exserted. *Seed* angular-ovoid, dull to slightly glossy, grey-brown, finely reticulate. (Figures 1, 2)

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld] 18 Sep. 2002, *R. Butler* 176-55 (PERTH 06358985); 18 Sep. 2002, *R. Butler* 176-56 (PERTH 06358993, 06232108); 17 Mar. 2005, *G.F. Craig* 6381 (PERTH 07218605); 21 Apr. 1998, *M. French* 452 (PERTH 05202396); 10 May 1989, *S.D. Hopper* 7208 (PERTH 05229499); 10 May 1989, *S.D. Hopper* 7209 (PERTH 05229502); 10 May 1989, *S.D. Hopper* 7210 (PERTH 05229510); 10 May 1989, *S.D. Hopper* 7216 (PERTH 05229588); 11 May 1989, *S.D. Hopper* 7230 (PERTH 05229677); 12 May 1989, *S.D. Hopper* 7233 (PERTH 05231876); 11 May 1989, *S.D. Hopper* 7234 (PERTH 05231884); 13 Sep. 1994, *N. Gibson & M. Lyons* 1716 (PERTH 05359708); 13 Sep. 1994, *N. Gibson & M. Lyons* 1724 (PERTH 05359694); 13 Sep. 1994, *N. Gibson & M. Lyons* 1725 (PERTH 05295130); 14 Sep. 1994, *N. Gibson & M. Lyons* 1833 (PERTH 05306914); 14 Sep. 1994, *N. Gibson & M. Lyons* 1918 (PERTH 05306922); 15 Sep. 1994, *N. Gibson & M. Lyons* 1761 (PERTH 05307007); 16 Sep. 1994, *N. Gibson & M. Lyons* 1561 (PERTH 05306930, 05307090); 16 Sep. 1994, *N. Gibson & M. Lyons* 1586 (PERTH 05306949); 16 Sep. 1994, *N. Gibson & M. Lyons* 1597 (PERTH 05306973); 18 Sep. 1994, *N. Gibson & M. Lyons* 1706 (PERTH 05307082, 05306981); 16 Aug. 1979, *K.R. Newbey* 5603 (PERTH 1448196, 2520621); 21 Apr. 1998, *D. Nicolle* 2271 (PERTH); 21 Apr. 1998, *D. Nicolle* 2272 (PERTH); 21 Apr. 1998, *D. Nicolle* 2273 (AD, CANB, PERTH); 30 Oct. 2000, *A.V. Slee & J. Connors* AVS 4310 (PERTH 05998336); 30 Oct. 2000, *A.V. Slee & J. Connors* AVS 4315 (PERTH 05998328).



Figure 1. Holotype of *Eucalyptus rhomboidea* (D. Nicolle 2274), scale = 3cm.



Figure 2. *Eucalyptus rhomboidea* (S.D. Hopper 7209, PERTH 05229502). A – habit and habitat; B – base of trunk; C – buds. Photographs: S.D. Hopper.

Distribution and habitat. Known only from level and slightly undulating areas in the Mt Gordon to Mt Glasse area of the Bremer Range between Lake King and Norseman, over a linear range of approximately 15 km (Figure 3). It occurs in low open woodland or tall shrubland vegetation on red clay-loams. Detailed ecological data and a list of associated taxa are included in Tables 1 and 2. Associated eucalypt species include *E. cylindriflora* Maiden & Blakely, *E. eremophila* (Diels) Maiden, *E. densa* Brooker & Hopper subsp. *densa*, *E. olivina* Brooker & Hopper, *E. pileata* Blakely, *E. salmonophloia* F. Muell., *E. tortilis* L.A.S.Johnson & K.D.Hill and *E. urna* D.Nicolle. *Acacia deficiens* Maslin and *Grevillea acuarria* Benth. are largely restricted to *E. rhomboidea* woodlands in the Bremer Range area.

Flowering period. Buds begin to form in April, some specimens collected in May have both buds and fruits present, (no collections from June, July or August), numerous specimens with both buds and fruits in September, two specimens with buds, flowers and fruits collected on September 16th and 18th, two specimens with buds, flowers and fruits collected on October 30th.

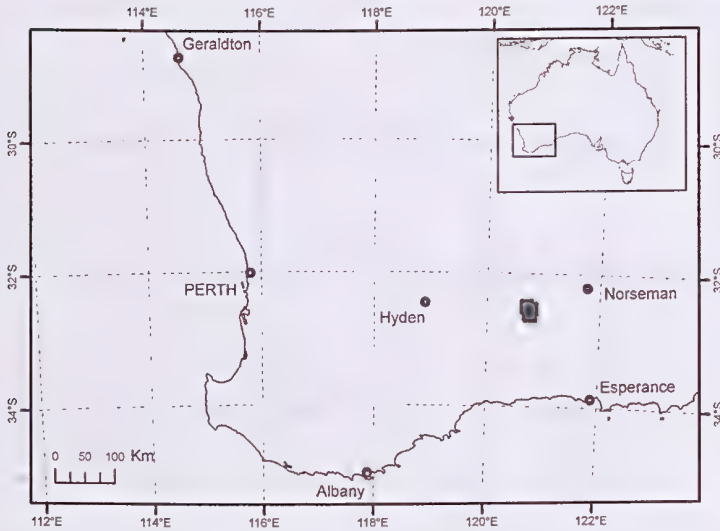


Figure 3. Distribution of *Eucalyptus rhomboidea* (■) in the Southwest Australian Floristic Region.

Conservation status. From 1998, *E. rhomboidea* has had a Priority Four conservation status, as defined by the Conservation Codes for Western Australian Flora (Atkins 2006; Western Australian Herbarium 1998–). The species is at risk from present and future mining activity in the Bremer Range and requires ongoing monitoring.

Etymology. From the Latin *rhombus* (diamond-shaped), referring to the diamond-shaped buds, distinctive and unique within *E. ser. Subulatae* and unique in the *E. transcontinentalis* complex.

Notes. *Eucalyptus rhomboidea* is a member of *E. ser. Subulatae* (Nicolle *et al.* 2006), distinguished by the combination of deeply bisected cotyledons, lack of pith glands in the branchlets, 7+ flowered inflorescences, fused, fragile, persistent, style remnants and greyish seed with a fine surface reticulation. Within the series, *E. rhomboidea* is part of the *E. flocktoniae* (Maiden) Maiden – *E. transcontinentalis* Maiden complex (*E. subser. Decurrentes* Brooker on the basis of the strongly decurrent and opposite juvenile leaves (Brooker 2000)). *Eucalyptus rhomboidea* is most closely related to *E. transcontinentalis* (especially subsp. *transcontinentalis*), differing from that species by the broader, thicker adult leaves; the erect inflorescences (\pm pendulous in *E. transcontinentalis*) on short peduncles and pedicels; the diamond-shaped buds with a conical operculum (elongated buds due to a long, horn-shaped operculum in *E. transcontinentalis*); and the obconical to pyriform fruit (urceolate to barrel-shaped in *E. transcontinentalis*).

Eucalyptus rhomboidea occurs within the distribution of *E. transcontinentalis*, although the two species are not sympatric. *Eucalyptus transcontinentalis* has not been recorded for the southern part of the Bremer Range, but occurs to the north (south of the Hyden – Norseman road) and to the south (Peak Charles area) of *E. rhomboidea* without apparent hybrids or intergrades.

Eucalyptus rhomboidea, *E. transcontinentalis*, *E. optima* L.A.S.Johnson & K.D.Hill and *E. urna* are the only non-sprouter species known in the series (Nicolle *et al.* 2006), regenerating from fire by seedlings only.

Eucalyptus sheathiana Maiden has been confused with *E. rhomboidea* because of its similar habit, bark, leaf and fruit morphology and branchlet glaucescence. However, it belongs to a different section (*E. sect. Dumaria* L.D.Pryor & L.A.S.Johnson ex Brooker). *Eucalyptus rhomboidea* can be readily distinguished by its bisected cotyledons, sessile, opposite, decurrent seedling leaves, lack of pith glands, diamond-shaped buds and dull, grey seeds.

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